

METHOD AND APPARATUS FOR MANUFACTURING A RESEALABLE PACKAGE

Cross Reference to Related Applications

[0001] This application is a Divisional of Application Serial No. 10/427,716, filed on April 30, 2003.

Field of the Invention

[0002] The present invention relates generally to a method of making polymer packages, for example, plastic bags. In particular, the present invention relates to a methods and apparatuses relating to closure mechanisms for a resealable bag.

Background of the Invention

[0003] Many packaging applications use resealable containers to store various types of articles and materials. These packages may be used to store and ship food products, non-food consumer goods, medical supplies, waste materials, and many other articles. Resealable packages are convenient in that they can be closed and resealed after the initial opening to preserve the enclosed contents. The need to locate a storage container for the unused portion of the products in the package is thus avoided. As such, providing products in resealable packages appreciably enhances the marketability of those products.

[0004] Resealable packages typically utilize a closure mechanism that is positioned along the mouth of the package. The closure mechanism often comprises profile elements or closure profiles that engage one another when pressed together. Typically a slider device used for opening the closure mechanism is attached to the closure

mechanism while the closure profiles are disengaged. This facilitates filling of the package with product after the slider is attached. However, attaching the slider to a closure mechanism in an open state results in difficulty in handling and aligning the pair of closure profiles during manufacturing. If the slider device is attached to the closure mechanism while the closure mechanism is closed, the closure mechanism must be opened before the package can be filled. Prior methods of opening the closure mechanism, including manually opening the closure mechanism, have proved to be inefficient from a manufacturing standpoint.

[0005] It is therefore desirable to attach the slider device to the closure mechanism while the closure mechanism is in a closed state, and to provide a method and apparatus for automatically opening the closure mechanism after the slider device has been attached. Alternately, the slider device may be attached after the closure mechanism has been opened. Further, the opening methods and apparatus of the present invention can be applied to a closure mechanism without a slider, such as a traditional “press-to-close” zipper.

Summary of the Invention

[0006] In accordance with the present invention, a method of making a resealable package is provided. The method comprises providing a closure mechanism, the closure mechanism comprising first and second closure profiles, the first and second closure profiles constructed and arranged to selectively engage, and wherein the first and second closure profiles are engaged. The method further comprises providing a pair of panels

comprising a flexible polymeric material, providing a means to open the closure profiles, such as inserting a wedge between the closure profiles, to disengage the closure profiles; and attaching the closure mechanism to the pair of side panels. The opening of the closure profiles and attachment of the closure mechanism to the side panels may occur substantially simultaneously.

Brief Description of the Drawings

[0007] For the present invention to be clearly understood and readily practiced, the present invention will be described in conjunction with the following figures, wherein like reference characters designate the same or similar elements, which figures are incorporated into and constitute a part of the specification, wherein:

[0008] The various features and benefits of the present invention are apparent in light of the following detailed description and the accompanying drawings, in which:

[0009] **FIG. 1** is a perspective view of a flexible, resealable package manufactured in accordance with an embodiment of the present invention.

[0010] **FIG. 2** is a schematic view of a process of manufacturing a resealable package in accordance with an embodiment of the present invention.

[0011] **FIG. 3** is a perspective view of a slider attachment device and a device for opening a closure mechanism used in accordance with an embodiment of the present invention.

[0012] **FIG. 4a** is a top view of the device for opening a closure mechanism illustrated in **Fig 3**.

[0013] **FIG. 4b** is an elevated, side view of the device for opening a closure mechanism illustrated in **Fig. 3**.

[0014] **FIG. 4c** is an alternate perspective view of the device for opening a closure mechanism illustrated in **Fig 3**.

[0015] **FIG. 4d** is an cross-sectional view of the device for opening a closure mechanism illustrated in **Fig. 3** taken along line 4d-4d (shown in **Fig. 4b**).

[0016] **FIG. 5** is an elevated, side view of a alternate device for opening a closure mechanism used in accordance with an embodiment of the present invention.

[0017] **FIG. 6a** is an elevated, side view of a wedge used as part of the device for opening a closure mechanism illustrated in **Fig 5**.

[0018] **FIG. 6b** is an elevated, end view of a wedge used as part of the device for opening a closure mechanism illustrated in **Fig 5**.

[0019] **FIG. 6c** is a perspective view with a cross-sectional view insert showing an alternate embodiment of a wedge that can be used in conjunction with the apparatus and methods described herein.

[0020] **FIG. 6d** is a schematic frontal view of the plow and guide legs of the wedge shown in **Fig. 6c**.

[0021] **FIG. 6e** is a perspective view showing the relational position between the wedge of **Fig. 6c** and a closure mechanism prior to opening the closure mechanism.

[0022] **FIG. 6f** is a perspective view showing the wedge of **Fig. 6c** passing into a closure mechanism to separate the closure profiles thereby opening the closure mechanism.

[0023] **FIG. 7** is an elevated, side view of the device for opening a closure mechanism illustrated in **Fig. 5**, illustrating its operation.

[0024] **FIG. 8** is an elevated, side view of a alternate device for opening a closure mechanism used in accordance with an embodiment of the present invention.

[0025] **FIG. 9** is a top view of the device for opening a closure mechanism illustrated in **Fig. 8**.

[0026] **FIG. 10a** is an end view of the device for opening a closure mechanism illustrated in **Fig. 8**.

[0027] **FIG. 10b** is an end view of the device for opening a closure mechanism illustrated in **Fig. 8**, illustrating the use of sealing bars in accordance with an embodiment of the present invention.

[0028] **FIGS. 11a-c** are cross-sectional views of an opening device and method that employ a perpendicular external force to open a closure mechanism.

[0029] **FIG. 12** is a cross-sectional view of an opening device and method that use a channel wedge to open a closure mechanism.

Detailed Description of the Invention

[0030] Fig. 1 illustrates an example of a resealable, flexible package **20** having a closure mechanism **41** with first and second closure profiles **23**, **25** and a slider device **11** to open and close the profiles **23**, **25**.

[0031] The resealable package **20** includes first and second opposed panel sections **31**, **33** made from a flexible, polymeric film. For some manufacturing applications, the first and second panel sections **31**, **33** are heat-sealed together along two edges **35**, **37** and meet at a fold line **39** in order to form a three-edged containment section for a product within the interior of the package **20**. The fold line comprises the bottom edge **39**. Alternatively, two separate panel sections **31**, **33** of polymeric film may be used and heat-sealed together along the two edges **35**, **37** and at the bottom **39**.

[0032] The resealable package **20** also includes a closure mechanism **41** made in accordance with an embodiment of the present invention. The closure mechanism **41** includes first and second closure profiles **23**, **25**. The first and second closure profiles **23**, **25** may be of any appropriate design known in the art. Example closure profiles are disclosed in U.S. Patent Nos. 5,983,466, 5,947,603, and 6,217,215.

[0033] In certain embodiments, a slider device **11** is mounted on the closure mechanism **41** to facilitate the opening and closing of the closure mechanism **41**. Slider devices and how they function to open and close such mechanisms, in general, are taught, for example, in U.S. Patent Nos. 5,063,644, 5,301,394, 5,442,837 and 5,664,229, each of

which is incorporated by reference herein, in its entirety. A preferred slider device is taught in U.S. Patent Nos. 6,293,701 and D434, 345 each of which is incorporated by reference herein, in its entirety.

[0034] In embodiments that include a slider device, a notch **52** is preferably disposed within the closure mechanism **41**. The notch **52** is designed to provide a “park place” into which the slider **11** settles when the closure mechanism **41** is sealed. The notch **52** decreases the chances of an incomplete interlock between the first and second closure profiles **23**, **25**. Example notches are disclosed, for example, in U.S. Pat. Nos. 5,067,208 and 5,301,395, each of which is incorporated by reference herein, in its entirety.

[0035] **Fig. 2** illustrates a schematic example of a horizontal form, fill and seal (“HFFS”) process for manufacturing a resealable package **20** in accordance with the present invention. The HFFS process described in U.S. Patent No. 6,293,896, which is incorporated by reference herein, in its entirety, is substantially similar to that described and shown herein with the obvious variation that the package of the present invention is inverted (i.e. the formation and filling in the present invention is from the top) whereas the formation and filling in the '896 patent occurs from the bottom. The first and second closure profiles **23**, **25** (not shown individually in **Fig. 2**) are provided in an engaged configuration as a continuous length of closure profile material **50**. Preferably, the closure mechanism material **50** is provided on a roll (not shown). The closure mechanism material **50** is unwound and fed to the HFFS process.

[0036] The slider **11** is attached to the closure mechanism material **50** by a slider application station **60**. The slider application station **60** applies the slider **11** to the closure mechanism material **50** through the use of any appropriate means known in the art, for example, the apparatuses as described in U.S. Patent Nos. 6,199,256 and 6,293,896, each of which are hereby incorporated by reference herein, in its entirety. The slider application station **60** may also be used to notch the closure profile material in order to provide the notch **52** (as shown in **Fig. 1**), as disclosed in U.S. Patent No. 6,199,256.

[0037] After the slider **11** is applied to the closure mechanism material **50**, the closure mechanism material **50** passes to the HFFS machine **250**. The material that comprises the side panels **31, 33** of resealable package **20** (as shown in **Fig. 1**) is provided on a roll **220**. The material is unwound and may optionally pass to perforators **230** that score the material to facilitate later removal of a header section **101**. The material then passes over a folding board **245** (as is known in the art) to form the two side panels **31, 33**. The folding board **245** may include a slitter (not shown), if e.g. the HFFS machine is operated in a different orientation.

[0038] In the embodiments of the invention illustrated in **Figs. 3-8**, the first and second closure profiles **23, 25** are disengaged by the closure mechanism opening apparatus **70** prior to the closure mechanism material **50** being attached to the first and second side panels **31, 33**. Alternately, the closure mechanism may be disengaged substantially simultaneously with the closure mechanism being attached to the side panels

(*i.e.* disengagement and attachment as a single step), or disengagement may even occur after attachment to the side panels.

[0039] An example closure mechanism opening apparatus **70** is illustrated in **Figs. 4a-4d**. The closure mechanism opening apparatus **70** comprises a rod **76** and a piston **72** that causes selective reciprocating movement of the rod **76**. A preferred rod **76** and piston **72** are manufactured by DE-STA-CO Industries, 31791 Sherman Drive, Madison Heights, Michigan 48071, Model 816, made of steel and aluminum. The rod **76** and piston **72** are preferably mounted on a stand-off base **74**.

[0040] The rod **76** is operably connected to a wedge **80** such that as rod **76** moves, the wedge **80** moves. For example, if the piston is activated to move the rod in a reciprocating manner, the wedge would move in a similar manner. As best shown in **Fig. 4d**, the wedge **80** is preferably tapered along its bottom edge to allow it to penetrate between the closure profiles **23**, **25**. A set of guide members **82** are attached at both ends of the wedge **80**. The guide members **82** act to align the closure mechanism material **50** as it passes through the closure mechanism opening apparatus **70**. The guide members **82** are preferably designed and arranged to allow the closure mechanism material **50** to pass between them and align the closure mechanism material **50** beneath the wedge **80** or in similar proximity to the wedge, depending on the spatial orientation of apparatus **70**. The guide members **82** are attached to the wedge **80** by any means known in the art, for example, by machined screws or by welding. Alternatively, the wedge **80** and guide members **82** may be formed integrally.

[0041] The closure mechanism opening apparatus **70** further comprises a three-sided guide channel **78**. The guide channel **78** preferably has a support blade **84** attached to one of its sides as best seen in **Fig. 4d**. The stand-off base **74** is attached to the top of guide channel **78**, which has an aperture **81** through its top side as shown in **Fig. 4a**. In this way, the selective reciprocating movement of the rod **76** causes the wedge **80** and guide members **82** to move up and down through the aperture **81** in the top of the guide channel **78**.

[0042] Preferably, the closure mechanism opening device **70** further includes a support blade **84** that is designed and arranged such that when the closure mechanism material **50** passes through the guide channel **78**, the closure mechanism material **50** straddles or rides on the blade **84**, which supports the closure mechanism material **50**. As stated previously, the blade **84** preferably assists in aligning the closure mechanism material **50** beneath the wedge **80**.

[0043] In operation, a length of the closure mechanism material **50** that corresponds to the length of a resealable package **20** passes into the guide channel **78**, on top of blade **84**. The progress of the closure mechanism material **50** is stopped. The piston **72** is then actuated whereby the rod **76** is extended. This causes the wedge **80** and guide members **82** to be moved through the aperture **81** of the top of the guide channel **78**. The guide members **82** are forced along the outside of the closure mechanism material **50**, and the wedge **80** is disposed between the closure profiles **23**, **25**. As the wedge **80** is moved downward by the rod **76**, the wedge **80** forces closure profiles **23**, **25**

to disengage along the length of the wedge 80. The wedge 80 is then withdrawn from the closure mechanism material 50. The opened closure mechanism material 50 is then advanced in an opened state for further processing, as is described below.

[0044] An alternate example embodiment of a closure mechanism opening apparatus 70 is illustrated in **Figs. 5-7**. In this embodiment, the guide channel 78 and the blade 84 are designed and function in a similar manner as in the embodiment illustrated in **Figs. 3-4d**. The closure mechanism opening apparatus 70 further comprises a piston 92, a brace 98, and a wedge 100. The piston 92 includes a rod 96 that may move in a selective reciprocating manner. In this embodiment, the wedge 100 is generally shaped as a sector of a circle as shown in **Fig. 6a**. The wedge 100 includes an arm 106 that extends from the corner of the sector that would otherwise correspond with the center of the circle from which the sector would be taken. The arm 106 includes an opening 108 through which a pin or rod may be inserted in such a way as to allow the wedge 100 to rotate around such a pin or rod. The arm 106 is operably connected to the rod 96 such that when the rod 96 is extended from the piston 92, the wedge 100 rotates, preferably in the direction of the arrow **R** shown in **Fig. 7**. Likewise, when the rod 96 is withdrawn, the wedge 100 will rotate in a direction opposite that in which it rotates when the rod 96 is extended. The wedge 100 is preferably attached to the channel 78 by a brace 98. In the embodiment illustrated in **Fig. 5**, the brace 98 includes an opening that may be aligned with the opening 108 through the wedge 100. In this way, a pin or rod that is inserted through the

opening **108** also serves to attach the wedge **100** to the brace **98**. The brace **98** is also preferably attached to the piston **92** by way of brackets **94, 95**.

[0045] As best shown in **Fig. 6b**, the curved edge **102** of the wedge **100** is tapered so that its leading edge **101** narrows to a point. The curved edge **102** also includes a pair of guide members **104** that are adjacent the leading edge **101**. Similar to the embodiment described above, and as shown in **Fig. 7**, a length of the closure mechanism material **50** that corresponds to the length of a resealable package **20** passes into the guide channel **78**, on top of blade **84**. The progress of the closure mechanism material **50** is stopped. The piston **92** is then actuated whereby the rod **96** is extended. This causes the wedge **100**, including guide members **104**, to rotate through an aperture (not shown) in the top of the guide channel **78**. The guide members **104** are forced along the outside of the closure mechanism material **50**, and the curved edge **102** of the wedge **100** is disposed between a portion of the length of the closure profiles. As the wedge **100** rotates, the curved edge **102** of the wedge **100** forces closure profiles to disengage. After the closure profiles disengage, the wedge **100** rotates in the opposite direction, thereby withdrawing from the closure mechanism material **50**. As one skilled in the art will recognize, an alternate embodiment to that illustrated in **Figs. 5-7** would be a blade designed to rotate in a complete 360° arc as it passes through the closure mechanism to disengage the closure profiles. The opened closure mechanism material **50** is then advanced in an opened state for further processing, as is described below.

[0046] Figs. 6 c-f illustrate an alternate embodiment of a wedge 200 for use with the opening apparatus 70, for example, as shown in Fig. 5. As described above, the various methods of opening a closure mechanism with the embodiment illustrated in Figs. 5-7 may include both reciprocal and rotational movement of the wedge (100, 200). For example, reciprocal movement is such that the wedge enters the closure mechanism in one direction (*e.g.* “R” in Fig. 7) and, after opening the closure mechanism, is removed from the closure mechanism in the opposite direction. Rotational movement of the wedge (100, 200) occurs by rotating the wedge (100, 200) with a controlled mechanical rotating device (not shown) such that the wedge moves in circular direction and passes into and out of the closure mechanism as the wedge (100, 200) scribes an arc at some aspect of circle “C” as depicted in Fig. 6e-f.

[0047] With reference to Fig. 6c, wedge 200 is shown consisting of a body 210, an opening plow 220 and guide legs 230, 232. As shown Fig. 6d, the plow 220 is preferably centered along a travel path “P” passing between guide legs 230, 232. This arrangement of the plow 220 with the guide legs 230, 232 facilitates the cooperation of these structures such that during operation the guide legs 230, 232 capture the closure mechanism and align the plow 220 to pass into the closure mechanism thereby opening the closure mechanism. It is preferable if the plow 220 has a tapered leading edge to facilitate its entry into the closed closure mechanism.

[0048] As further illustrated in Figs. 6d-6f, the wedge 200 is preferably rotated into the closure mechanism material 50 to thereby separate (open) closure profiles 23, 25.

After opening, the opened closure mechanism can be advanced for further processing (e.g. attachment, filling, etc.).

[0049] A further preferred embodiment of the invention is illustrated in **Figs. 8-10b**. In this embodiment, the guide channel **78** and the blade **84** are designed and function in a similar manner as in the embodiments described above. In this embodiment, the channel **78** may also include an opening **79** (e.g. shown in **Figs. 10a – 10b**) through which a pair of sealing bars, **130, 132** may pass, as described below. In this embodiment, the closure mechanism opening apparatus **120** comprises a rod **124** and a piston **122** that causes selective reciprocating movement of the rod **124**. A preferred rod **124** and piston **122** are manufactured again, by DE-STA-CO Industries.

[0050] In the embodiment illustrated in **Figs. 8 – 10b**, the wedge **126** is generally cylindrical in shape, although one end may be tapered to facilitate opening of the closure mechanism material **50**. The piston **122** and rod **124** are held in place above the guide channel **78** by brace **134**.

[0051] This embodiment may take advantage of the fact that, when certain types of sliders **11** are attached to the closure mechanism material **50**, a small opening **51** (as shown in **Fig. 9**) is created between the closure profiles **23, 25** immediately adjacent to the slider **11**.

[0052] In operation, a length of the closure mechanism material **50** that preferably corresponds to the length of a resealable package **20** passes into the guide channel **78**, on top of blade **84**. The progress of the closure mechanism material **50** is stopped at a point

when the opening **51** is directly beneath the wedge **126**. The piston **122** is then actuated whereby the rod **124** is extended. This causes the wedge **126** to be moved through the top of the guide channel **78**. The wedge **126** is disposed in the opening **51** between the closure profiles **[23, 25]**.

[0053] Preferably, the guide channel **78** is aligned with sealing bars **130, 132** that are used to seal the side panels **31, 33** to the closure profiles **23, 25** such that the sealing bars **130, 132** may pass through the opening **79** in the guide channel **78**. In this embodiment, it is preferred to have the sealing bars **130, 132** move together to seal the side panels **31, 33** to the closure profiles **23, 25** at substantially the same time that the wedge **126** is inserted into the opening **51**. The sealing bars **130, 132** are then withdrawn from the guide channel **78**. The closure mechanism material **50** is then advanced the length of one package **20** with the wedge **126** still inserted between the closure profiles **23, 25**. As will be understood by one of ordinary skill in the art, this movement will cause the engaged portion of the closure mechanism material **50** to disengage. After the closure mechanism material **50** has been advanced, and thus disengaged along the length of one package **20**, the wedge **126** is withdrawn from the closure mechanism material **50**. The opened closure mechanism material **50** continues in an opened state for further processing, as is described below.

[0054] In the embodiments illustrated in **Figs. 3-7**, the closure mechanism material **50** is opened, but not yet sealed to the side panels **31, 33**. In the embodiment illustrated in **Figs. 8 – 10b**, the closure mechanism material **50** is positioned between the side panels

31, 33. The side panels **31, 33** are then heat sealed to the closure profiles **23, 25** by sealing bars **130, 132**. The various embodiments of this invention contemplate that opening of the closure mechanism **41** and sealing of the closure profiles **23, 25** to the side panels **31, 33** can occur either sequentially (*e.g.* opening followed by sealing or sealing followed by opening) or simultaneously (*i.e.* opening and sealing at the same station and substantially at the same time).

[0055] Two additional embodiments are schematically illustrated in **Figs. 11-12**, each of which incorporates a force that is external to the closure mechanism **41** to open the closure profiles **23, 25**. With reference to **Fig. 11a**, a cross-sectional view of an alternate closure mechanism **41** is shown in a closed or engaged position. The engaged mechanism **41** is positioned between two opposing flat surfaces **140, 141**, on moveable wedges **150, 151**. Upon activating the opening apparatus **70** illustrated in **Fig. 11a**, the moveable wedges **150, 151** move towards each other, as best shown in **Fig. 11b**, with sufficient force to “pinch” the closure profiles **23, 25** of closure mechanism **41** into an open position. The pinching occurs as surfaces **140, 141** come in contact with closure profiles **23, 25**. Following this “pinch-open” action, the wedges **150, 151** move apart, as shown in **Fig. 11c**, and reset for admission of the next closure mechanism to be opened.

[0056] One of skill in the art will recognize many variations of practicing the invention illustrated in **Figs. 11a – 11c**. For example, one of the moveable wedges (**150**) could be replaced with an immovable surface such that only one moveable wedge (**151**)

would have to move and pinch the closure mechanism against the immovable surface to open these closure profiles.

[0057] A further embodiment utilizing a force external to the closure mechanism to open the closure profiles is illustrated in cross-section in **Figs. 12a-b**. In this embodiment, a channel wedge **160** is placed over closure profile **50** (**Fig. 12a**), such that said action of placement forces open the closure profiles **23, 25** (**Fig. 12b**). Preferably, the interior dimension **162** of the channel wedge **160** is proportioned appropriately to accomplish the opening of the closure profiles **23, 25** without disrupting the integrity of the package (not shown).

[0058] It is contemplated that the channel wedge embodiment operates in a substantially similar manner the method as previously described for the wedge illustrated in **Figs. 4a – 4d**. The main difference between these distinct embodiments is that the closure mechanism illustrated in **Figs. 4a – 4d** lends itself to being split-open by inserting a wedge between the closure profiles, while the closure mechanism of **Fig. 12** is opened by a force applied externally to the closure profiles.

[0059] Referring back to **Fig. 2**, after opening the closure mechanism in accordance with the invention disclosed herein, the continuous line of packages continues to sealing bars **112** that seal the sides **31, 33** of the package **20**. The continuous line of packages then pass under hopper **114** that contains the product to be placed in package **20**. As the packages pass under the hopper **114**, product **241** passes through the mouth of the header section **101** and into the interior of the package **20**. In certain embodiments,

the mouth of the header section **101** is then sealed by sealing bars **116** to form a tamper-evident structure. Finally, the continuous line of packages is separated into individual packages by cutting knife **118**.

[0060] While specific embodiments and methods for practicing this invention have been described in detail, those skilled in the art will recognize various manifestations and details that could be developed in light of the overall teachings herein. Accordingly, the particular mechanisms disclosed are meant to be illustrative only and not to limit the scope of the invention which is to be given the full breadth of the following claims and any and all embodiments thereof.